Menlo Park Notebook #45 [N-79-04-09]

This notebook covers the period April-September 1879. Most of the entries are by Edison, Charles Batchelor, and Francis Upton. A few entries are by John Kruesi. Included are notes, calculations, and drawings of generators; calculations about electric power distribution; notes and drawings of the telephone; and notes by Upton on repairing lamp problems in the stateroom of the Jeannette, a ship being outfitted for an arctic expedition. The book contains 104 numbered pages followed by about 200 unnumbered pages.

Blank pages not filmed: 62-63, 66-67, 86-95, 98-104.

Missing page numbers: 21-22, 69-70.

No 45

LIBRARY OF THE

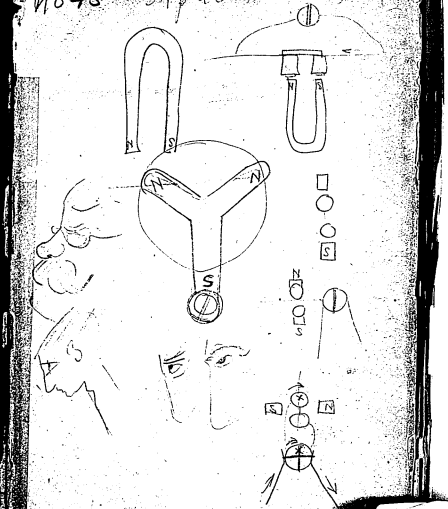
BOARD OF PATENT CONTROL,

120 BROADWAY, NEW YORK.

GENERAL ELECTRIC.

_____, 189_

No 45 April 10 1879 Tag

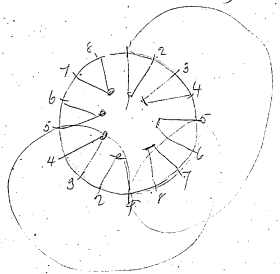


2

3 7/8 inches
1/4
17 4 4
3 7/4
3 6/4
3 4 2
1 1 1
1 4 5 2/4
3
4 3 5 6

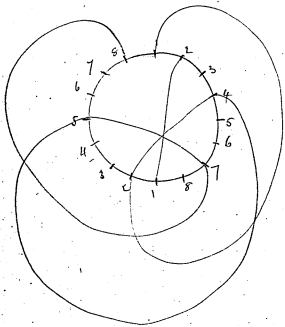
April 9 1894

Jute

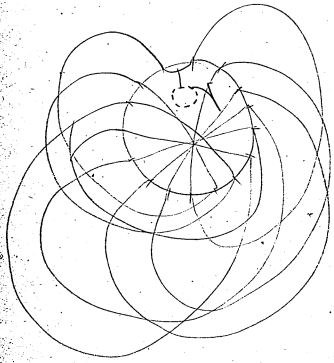


April 10 1879

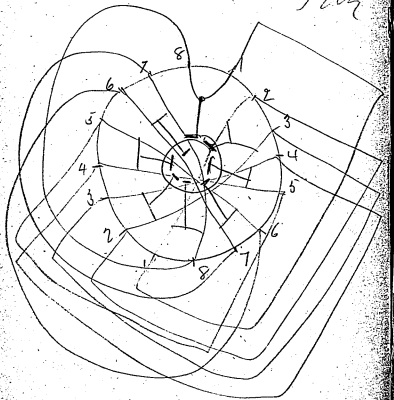
Tax



April 10 1874
TCR



April 9
1871
Fah

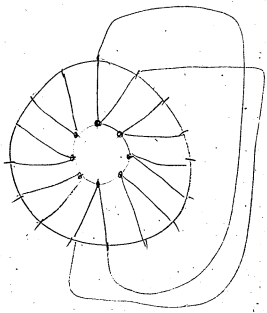


10

11.

April 9

1879 Tues



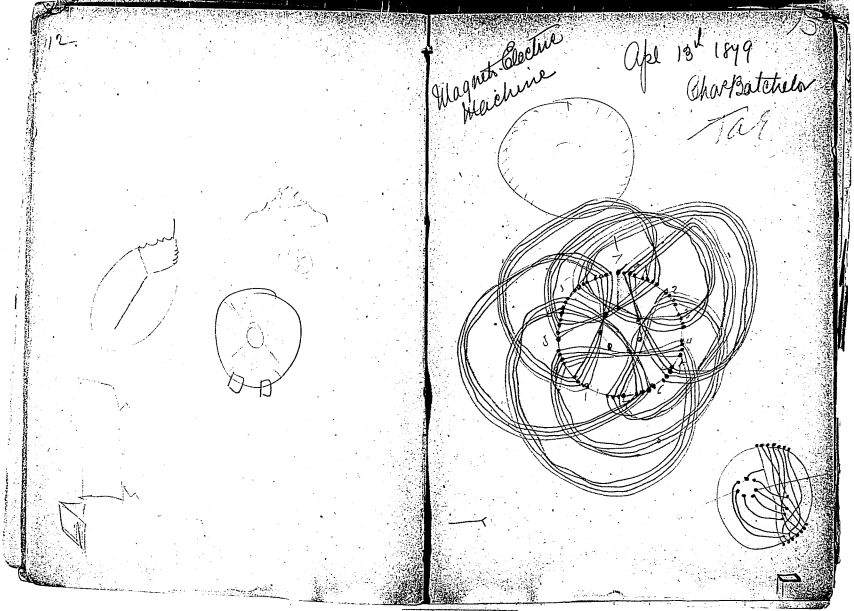
12.

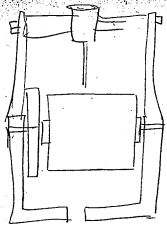
Magnet Electric Machine

April 13th 1849

Chas Batchelder

Tag

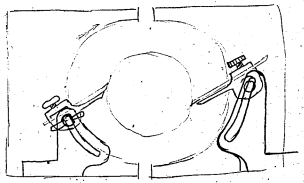


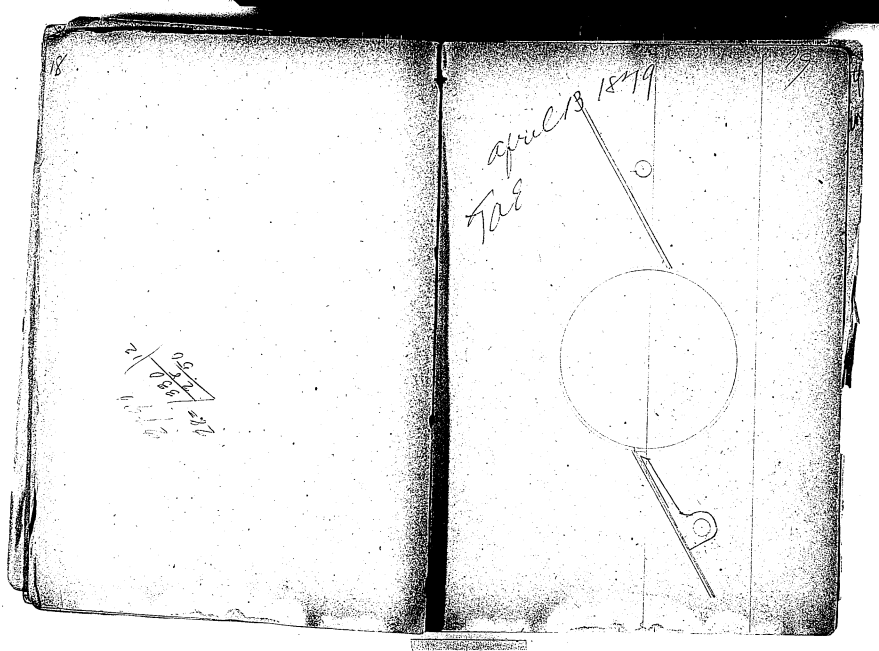


April 13
1874
TE

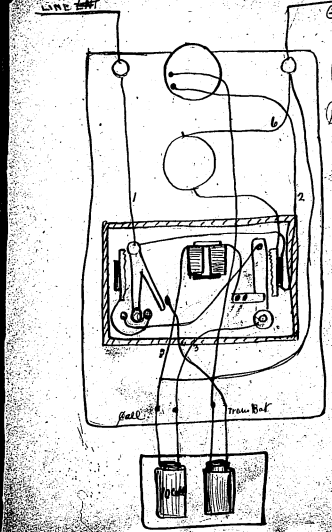
16

April 13 1874
J.A.S.




18
April 13 1879
Tool

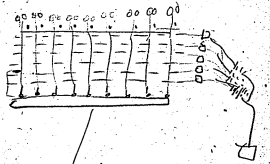
Connections for Bolam telephone



May 15 1906
Chas Batchelor
F. A. E.

May 13 1879

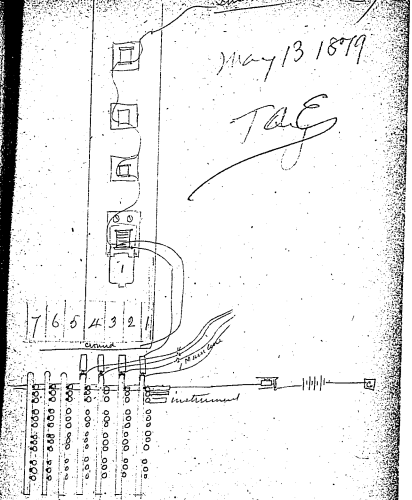
Jas



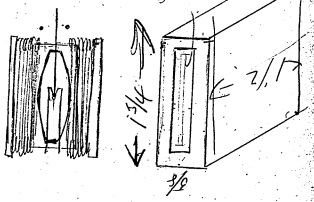
Instrument

May 13 1879

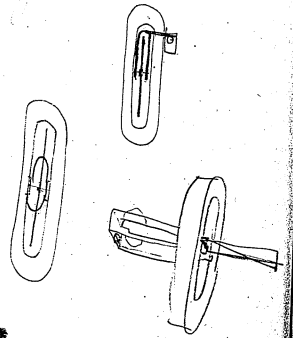
T. A. E.



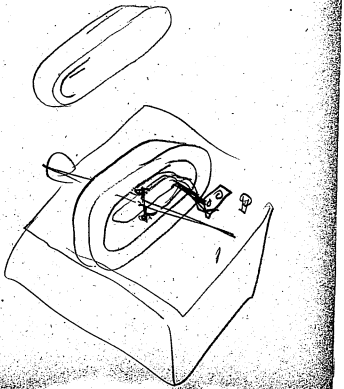
May 13 1844 Joe



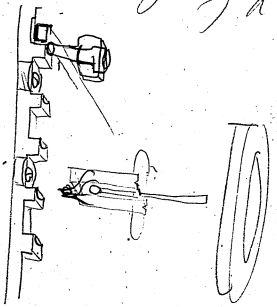
May 13 1879
TLE



May 13 1879
TLE

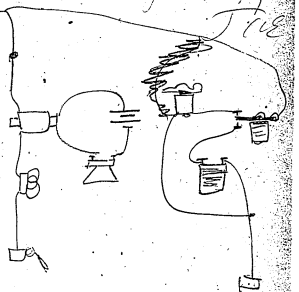


May 13 1879
T A E

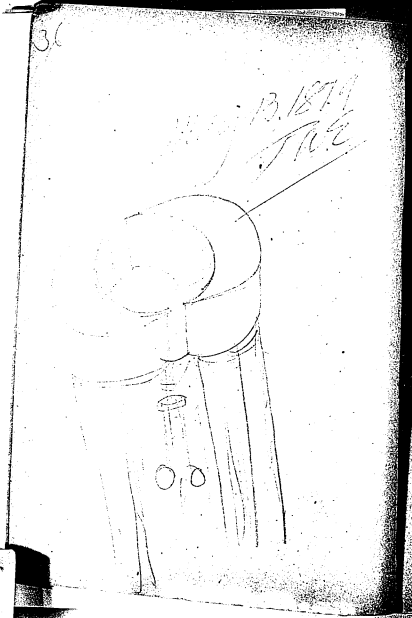


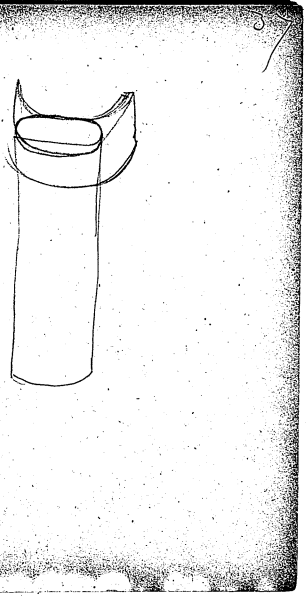
Telephone May 13 1874

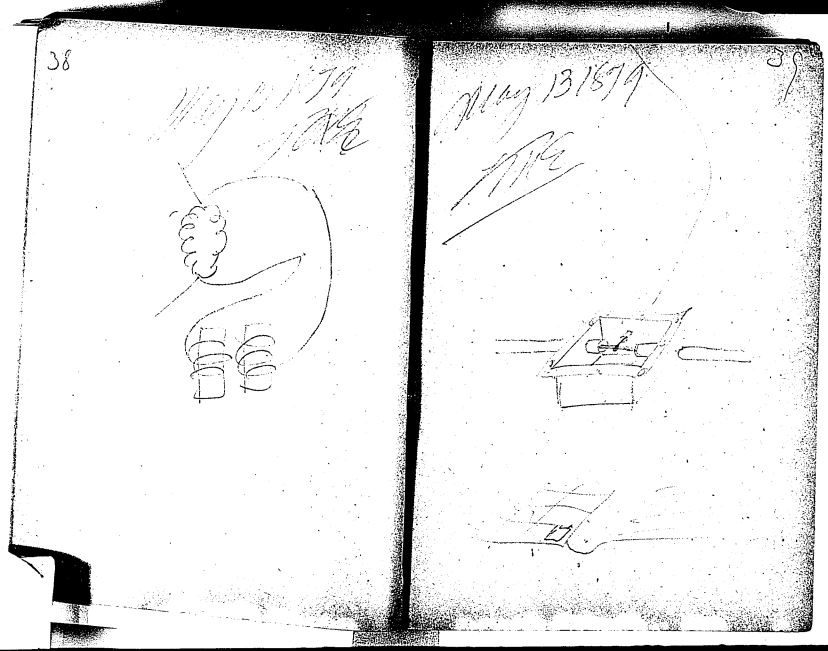
Line



Put other end like this


BATH
TUB





40

16
300
4800 60

$ 1200

4800 | 1200
28800

$ 1200.

240

1
240

240) 1.000 (.41
960
40
240
200

May 15-1871 Jr 41

4.1 Mills per

H.P. per hour

60 H.P. 16 Hours

per day 1 year

300 working days

300
32
9 | 268
30
15
180

42

6000 burners

4 feet burners

$1.60 per 1000 for

$\frac{1}{250}$ X $1.60 per hour

$\frac{1.60}{250}$ $ .25

.16

4

.0064

6.40

6.4 mills per hour

Power at 10 mills per hour

six lamps

each 1.66 mills per hour

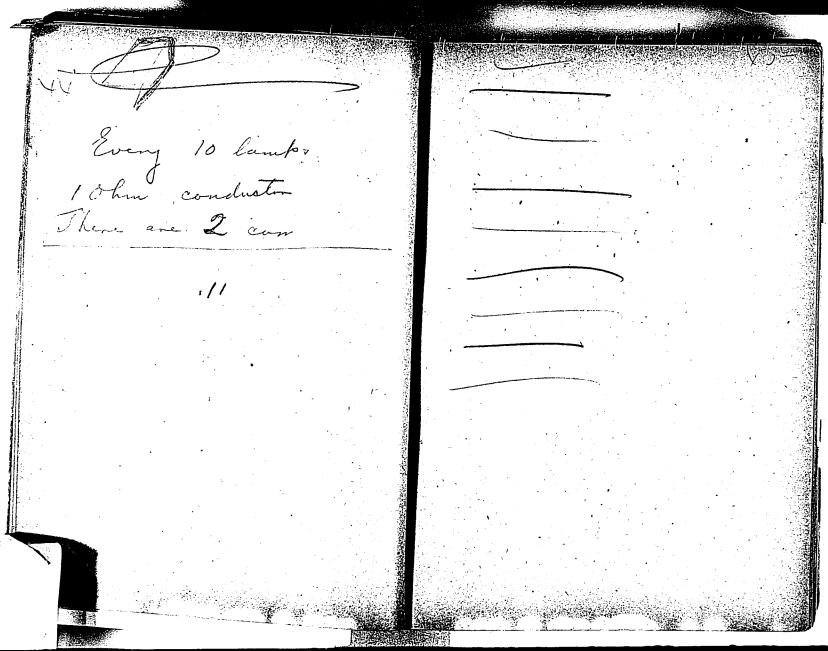
four burners

$33.000 per year

6000 lamps Parallel wire

10 Ohms. 10 ohms

$1.00 Interest the rest


Every 10 lamps
1 Ohm conduction
There are 2 cuts
11

4) 5280
1320

20) 2640
132

2.1206
2.1206
2.0969
2.3381

217 lbs
43

4) 8 2 1.6

Distance = x 2

=

48

$\frac{8.5}{17} = 8.$

12

8

9 10

$\begin{array}{r} 2.5 \\ 4.8 \\ \hline 20 \\ 40 \\ \hline 140 \\ 4 \\ 8 \\ \hline 12.5 \\ 4.3 \\ \hline 1 \end{array}$

1 4 6 9 16 25 36 49 64 81 100 121 144 169 196 225 256 289 324

$\begin{array}{r} 324 \\ 121 \\ \hline 203 \end{array}$

49

10

132.0
8
1056.0

28 | 2 8 n q .
105

2.0212
2.0212
2.0964
2.1398

128 lbs
32

Hours

$(a+1)(a+2)(a+3)(a+4)(a+5)$

52

217 lbs 1/4 mile

1000 feet

50 men on 1000 feet

20

2000 feet

of wire

~~1.6990~~

~~1.6990~~

50 | 2000

100

20 | 2000

100

2.

2.

2.0969

2.0969

125 lbs of wire

20 | 1960

98

1.9912

1.9912

2.0969

2.0793

? lbs of wire

120 lbs of wire

53

5K

20 / 1920
96

1.9823
1.9823
2.0969
2.0615

115 lbs

22 / 1888
94

1.9738
1.9738
2.0969
~~2.0245~~
2.0431

110 lbs

20 / 1848
92

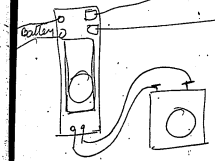
1.9638
1.9638
2.0969
2.0245

5J

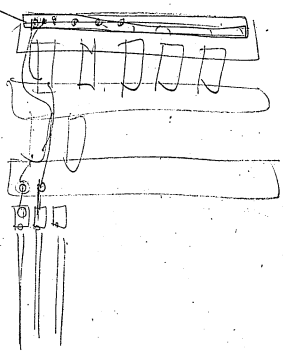
56

May 16 1879

Connection



Put a little glue to each



May 16 1879 Fri

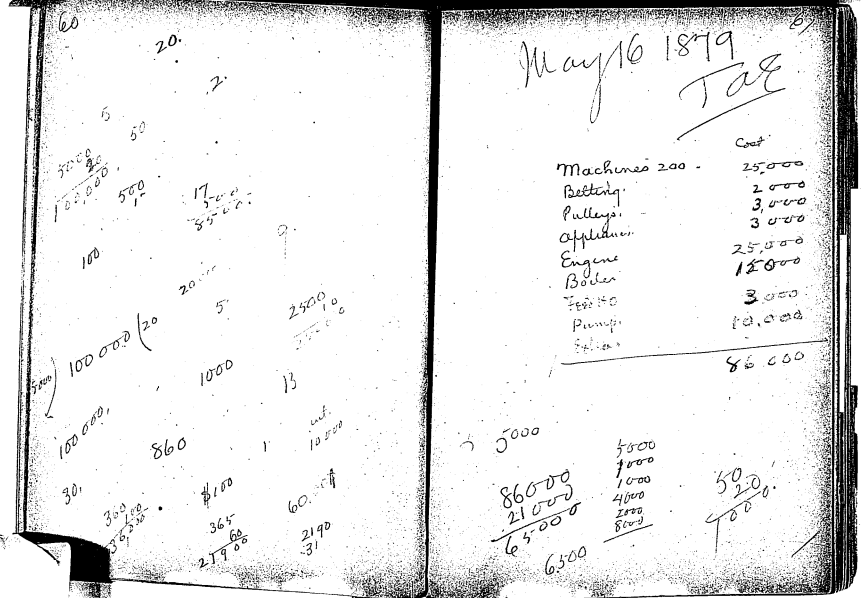
Have spring made for dear

$\frac{3}{32}$ wide

Have pattern for damper

See about rubber tubing for connections

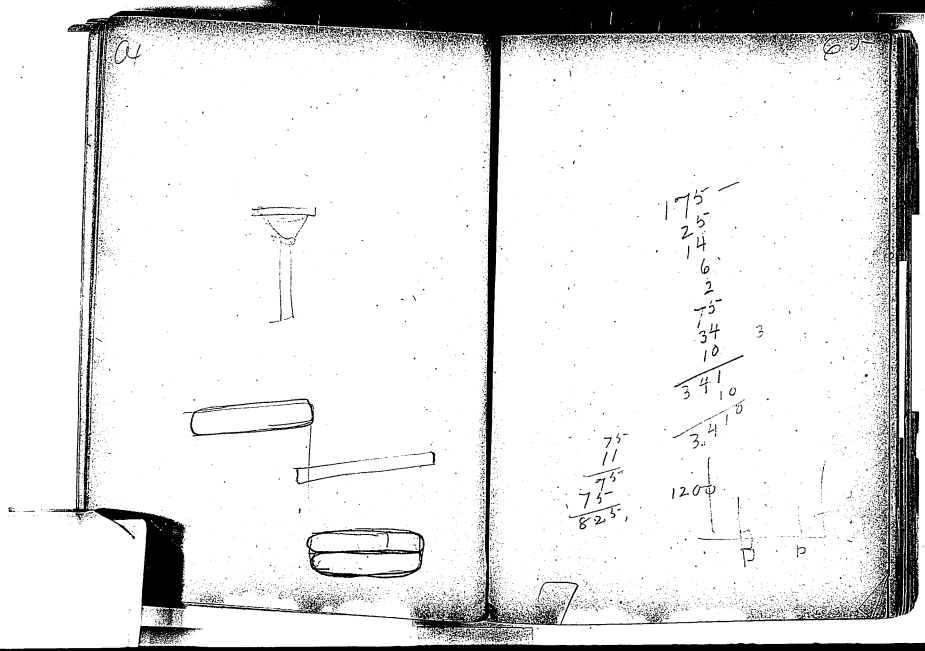
~~put in~~ 8/32 ~~set bolts~~ screws for damper

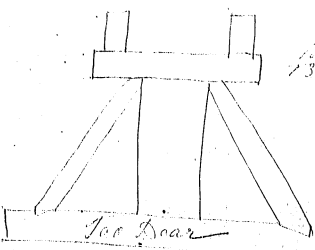


May 16 1879

Tax

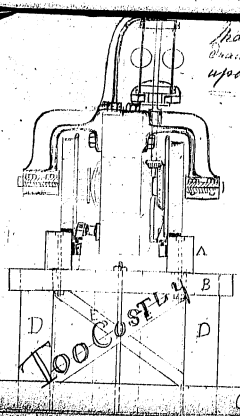
	Cost
Machines 200 -	25,000
Belting	2 000
Pulleys	3,000
appliances	3 000
Engine	25,000
Boiler	15000
Feed [illegible]	3,000
Pumps	10,000
Safes	
	86 000


175
25
14
6
2
75
34
10
341
341
75
11
75
825
120
P
P



1514.00

Machine of 1000 pounds draw upon a level 2.3 3/4 pounds upon a grade of 250 pr mile 1.74



May 16 1879

3460.00

12

A - 2100
B - 504
C -
E

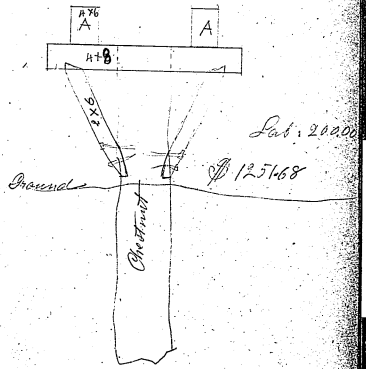
$5.00

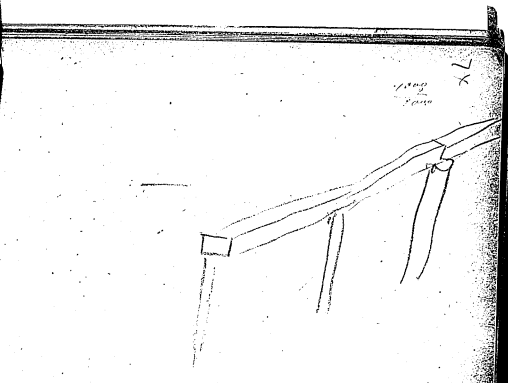
500
506
200
100
13.05

9
1 1.68

1 51

May 16 1879 Jas 30





300 tons 52.8 per mile — 16 miles

.2 X 1000 = 200
11.42 + 8 = 8.4242

2240
100 / 67200 = 672 / 1595.4 = 25
1344
2514
2240
274

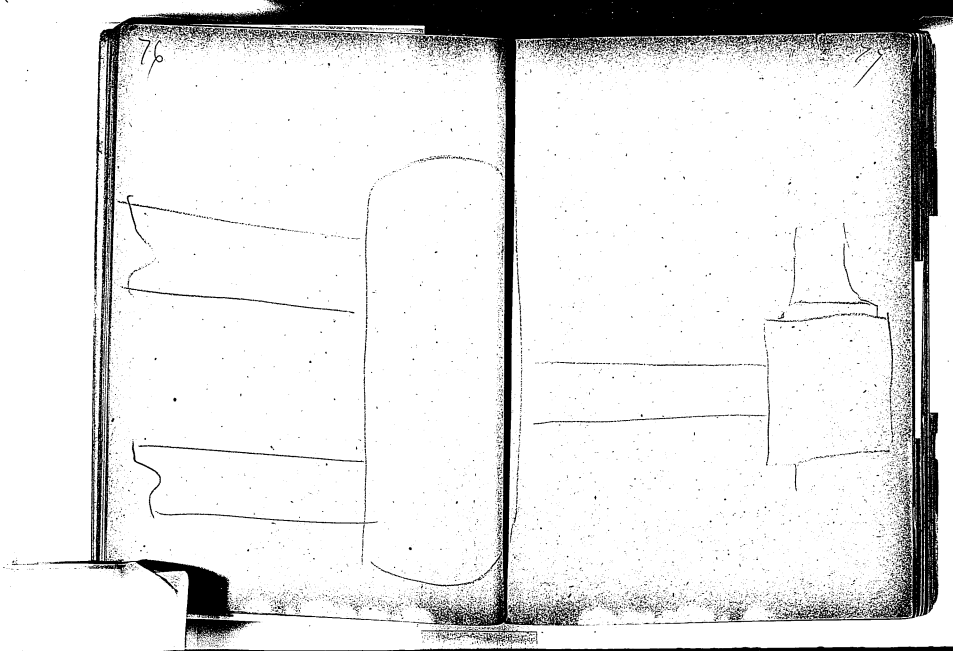
8.4242 / 200.0000 = 23.74
16848
31516 0
23276
62434 0
58469 0
3464 60

.2 X 1000 = 200
11.42 X 250 ÷ 8 = 114.35

1.74
11405 / 20000
11405
85050
79835
52150

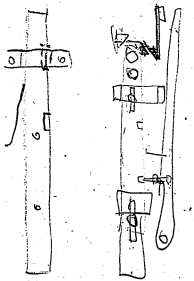
4242
250
1060500
114

1.5 5280 11.42
5280
5280
5280



May 16 1879

Jas

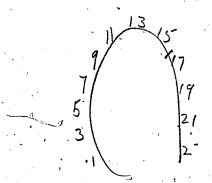


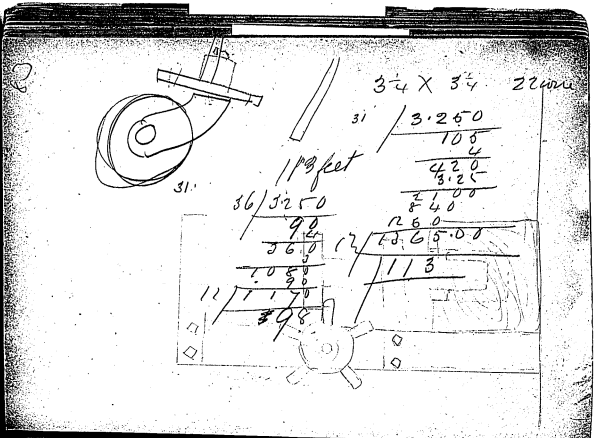
80

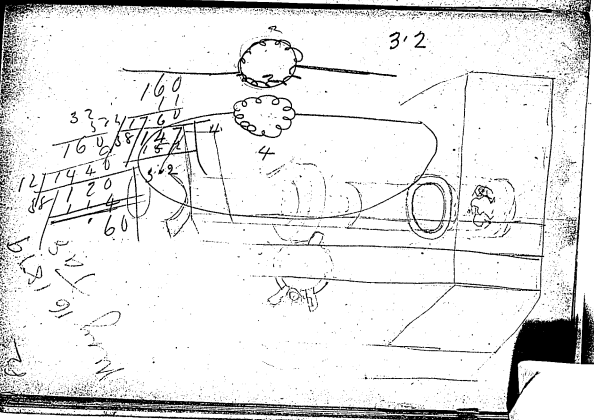
81

1
3
5
7
9
11
13
15
64

17
19
21
67

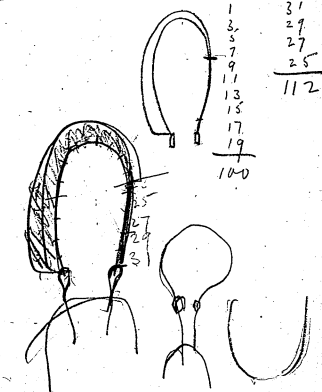


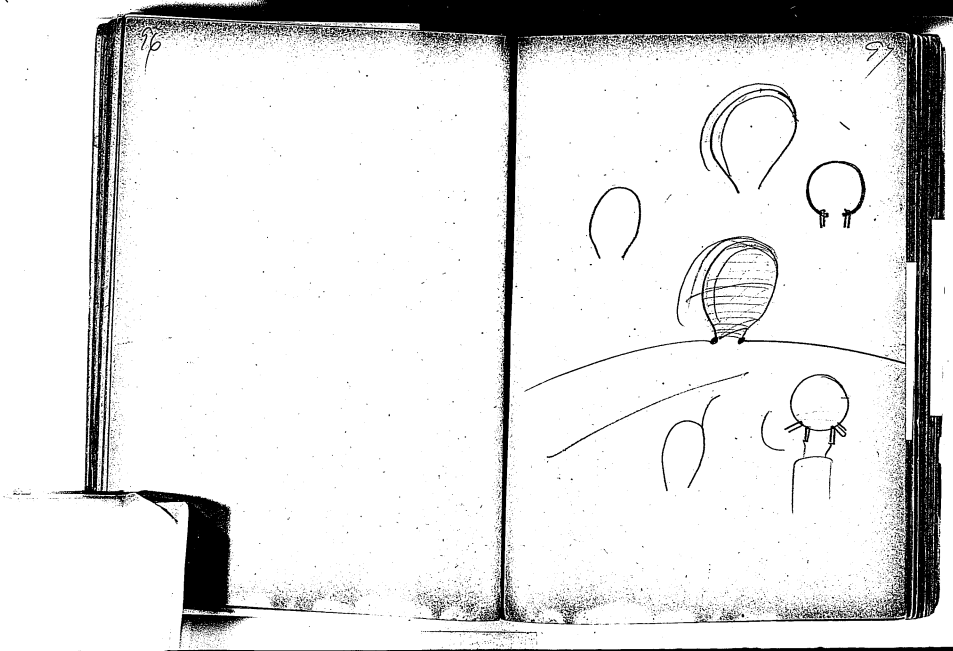

3¼ X 3¼ 22 cu
31
3.25
105
420
3.25
2100
840
260
5.65.00
113
31
1 lb feet
36
3.25
90
360
705
90
12
1170
98

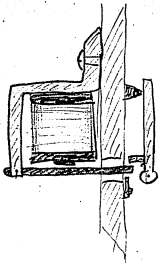

3.2
160
160
32
160
88
12
1440
120
144
60
4
4
5.12

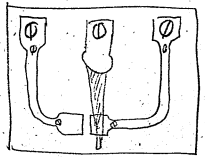
84

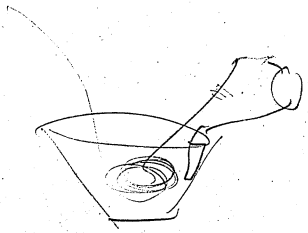
Regulator




96
97







Make 12 buttons.
Chalk + water same amount ($\frac{1}{2}$ H_2O)

No 1 2 grain Carb Soda dissolved in H_2O

2 ditto

3 2 grain Chl Codeine in H_2O

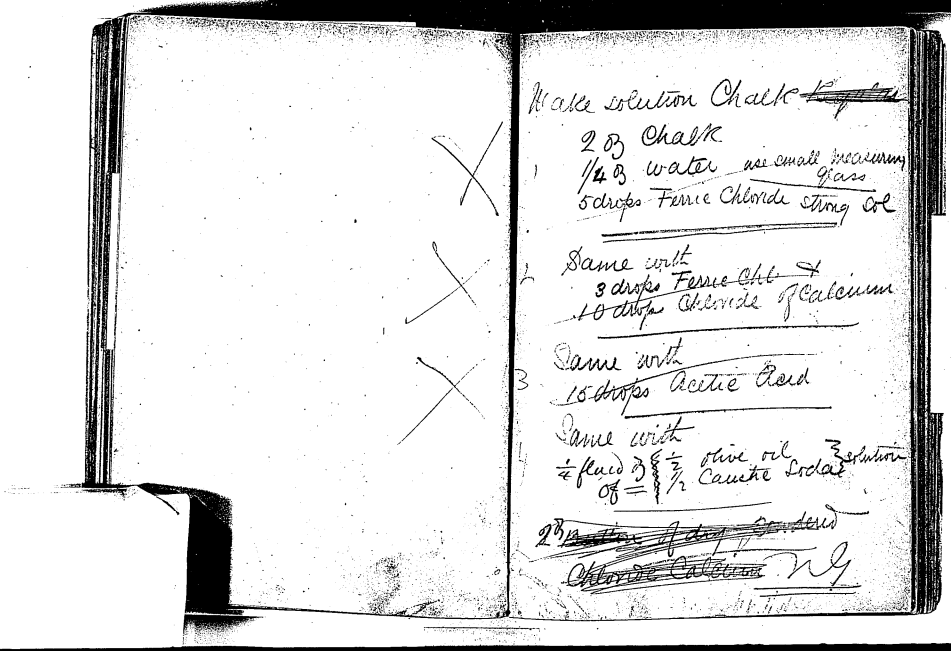
4 ditto

5 & 6. 2 grain Chl. Cal.

7 & 8 2 grain Chl Ammonium

9 & 10 2 grain Sulphate Potash

11 & 12 2 grain Nitrate Ammonium



Make solution Chalk ~~Emp~~

2 ℥ Chalk
1/4 ℔ water use small measuring glass
5 drops Ferric Chloride strong sol

Same with
3 drops Ferric Chl
10 drops Chloride of Calcium

Same with
15 drops Acetic Acid

Same with
½ fluid ℥ = { ½ olive oil / ½ Caustic Sodae } ℥ solution

2 ℥ ~~Chloride Calcium~~ NG

7½

2 oz Chalk
½ oz Chl Calcium

8½ 2 oz Chalk
½ oz Caustic Soda
Used Chalk
instead of Phos-Lime
through mistake

10 ~~1 oz Chalk~~
~~1 oz Dry powd. Chlor. Calc.~~

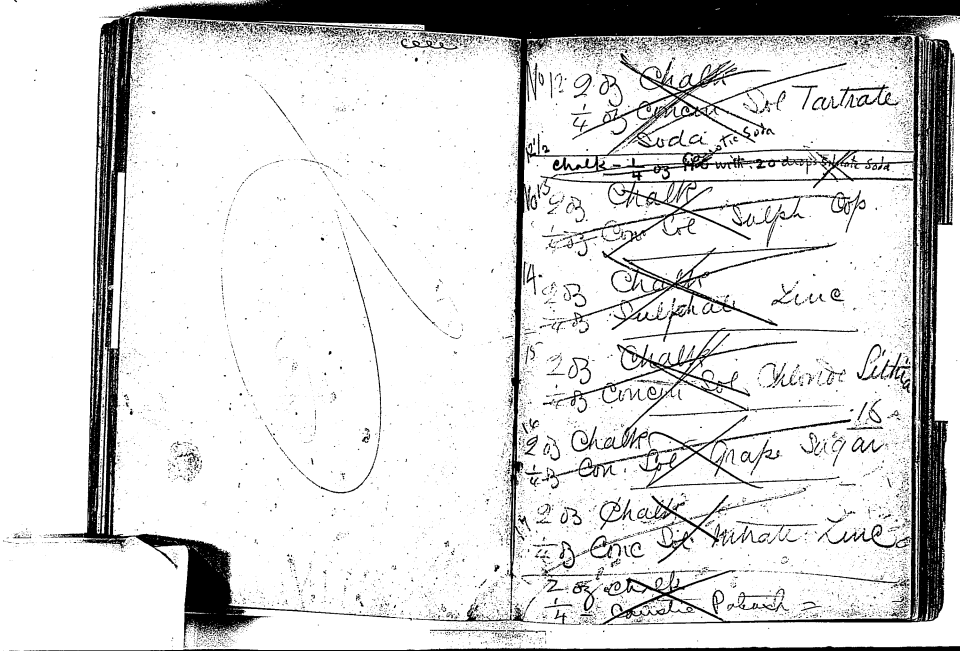
~~7½ oz Chalk~~
~~½ oz Dry powd. Chlor. Calc.~~

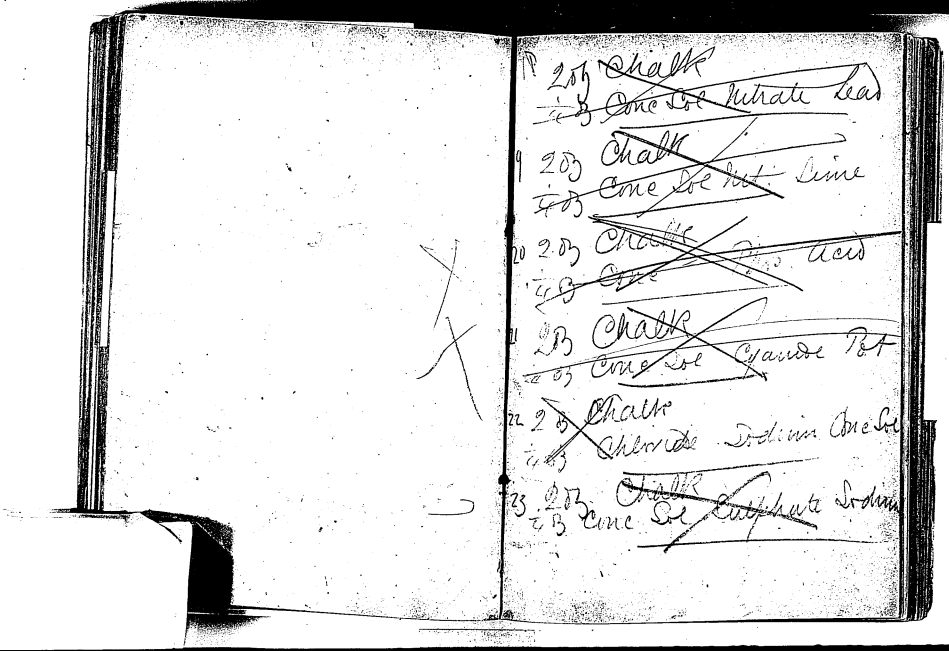
8 1½ oz Chalk
½ oz powd. Phosp. ~~Soda~~

9 2 oz ~~phosphate~~ Lime
¼ oz ~~Caustic~~ Soda

10 2 oz phos. Lime
~~¼ oz Concentrated Sol Chlor~~
Cal

11 2 oz ~~Chalk~~
½ oz Concn ~~Sol~~ Tartaric acid





2 oz Chalk
½ oz Conc Sol Sulphite Sodium

2 oz Chalk
½ oz Conc Sol Hyposulphite Soda

2 oz Chalk
½ oz Conc Sol ~~Permanganate~~ Potash

2 oz Chalk
½ oz Conc Sol Bichromate Pot-

2 oz Chalk
½ oz Conc Sol. Iodide Pot

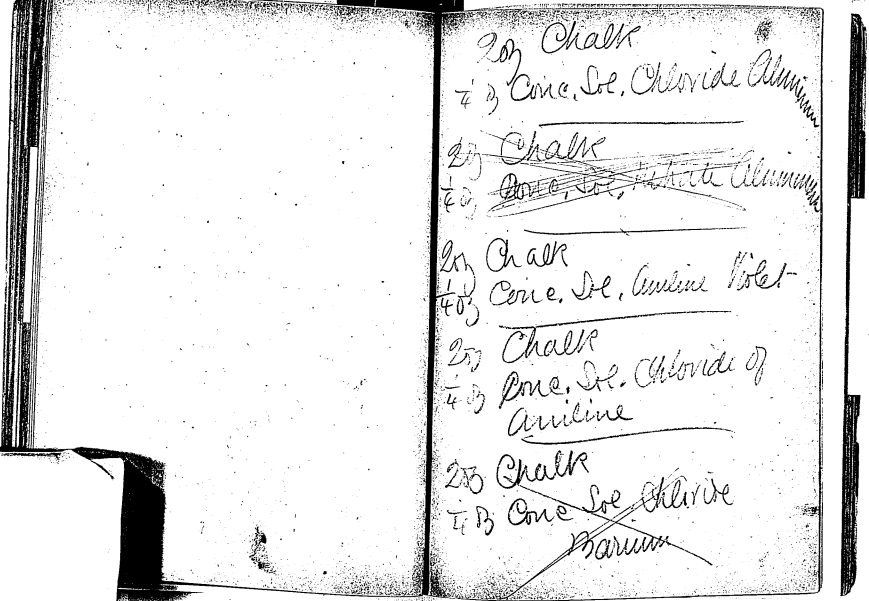
2℥ Chalk
¼ ℥ Conc Sol Ferrocyanide Pot.

2℥ Chalk
¼ ℥ Conc Sol Ferrocyanide Pot

~~2℥ Chalk~~
~~¼ ℥ Hydrofluoric Acid~~

2℥ Chalk
¼ ℥ Conc Sol Alumn

2℥ Chalk
¼ ℥ Conc Sol Acetate of Alumina


2 oz Chalk
1/4 oz Conc. Sol. Chloride Aluminum
2 oz Chalk
1/4 oz [illegible]
2 oz Chalk
1/4 oz Conc. Sol. Aniline Violet
2 oz Chalk
1/4 oz Conc. Sol. Chloride of Aniline
2 oz Chalk
1/4 oz Conc Sol Chloride Barium

2ʒ Chalk
¼ ʒ Conc Sol. Nitrate Bismuth

9ʒ Chalk
1ʒ Chloride Lime

1½ʒ Chalk
½ Chloride Lime

1ʒ Chalk
½ ʒ Eddy Lamplough
¼ ʒ Caustic Potash

2ʒ Chalk
¼ Conc Sol Chlor. Cadmium

2 lb Chalk
¼ lb Conc. Sol. Sulph. Cadmium

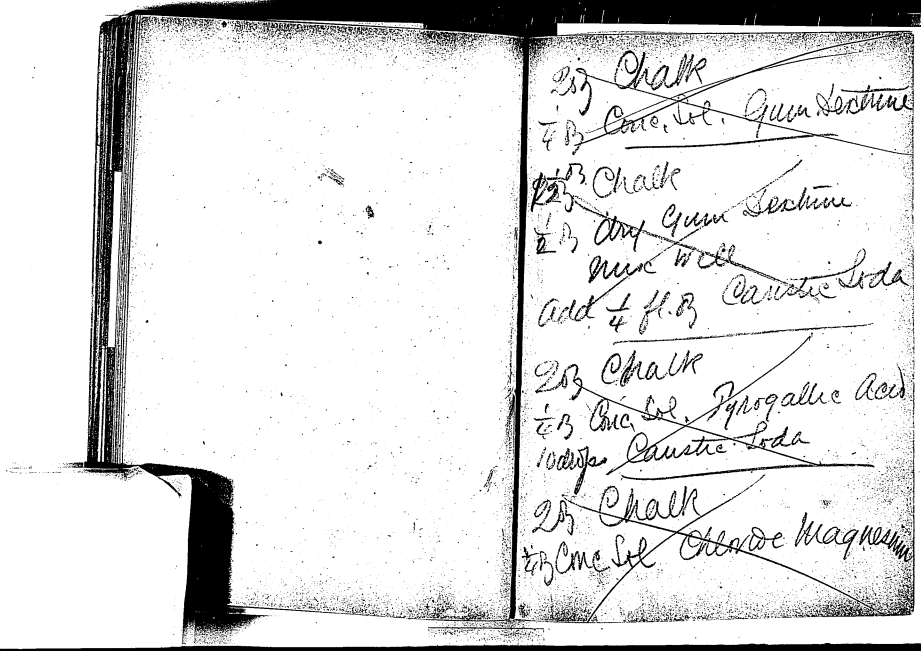
2 lb Chalk
¼ lb ~~Conc.~~ Distilled water

2 lb Chalk
¼ lb Conc Sol. Oxalate Cerium

2 lb Chalk
¼ lb Conc Sol Chloride Cobalt

~~2 lb Chalk~~
~~¼ lb Conc Sol Nitrate Cobalt~~

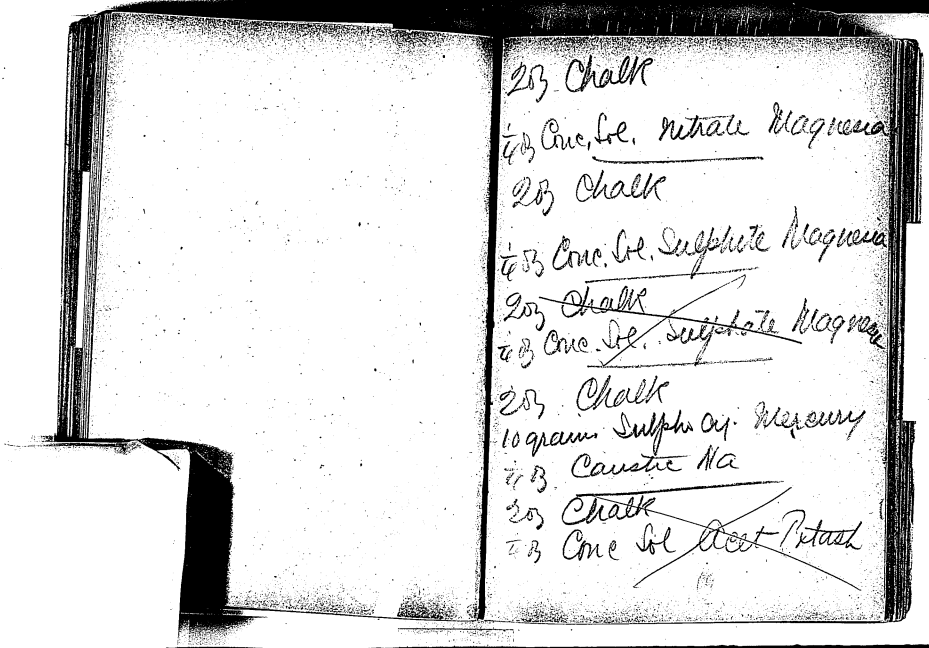
= Nos 15


2 ℥ Chalk
¼ ℥ Conc. Sol. Gum Tragacanth

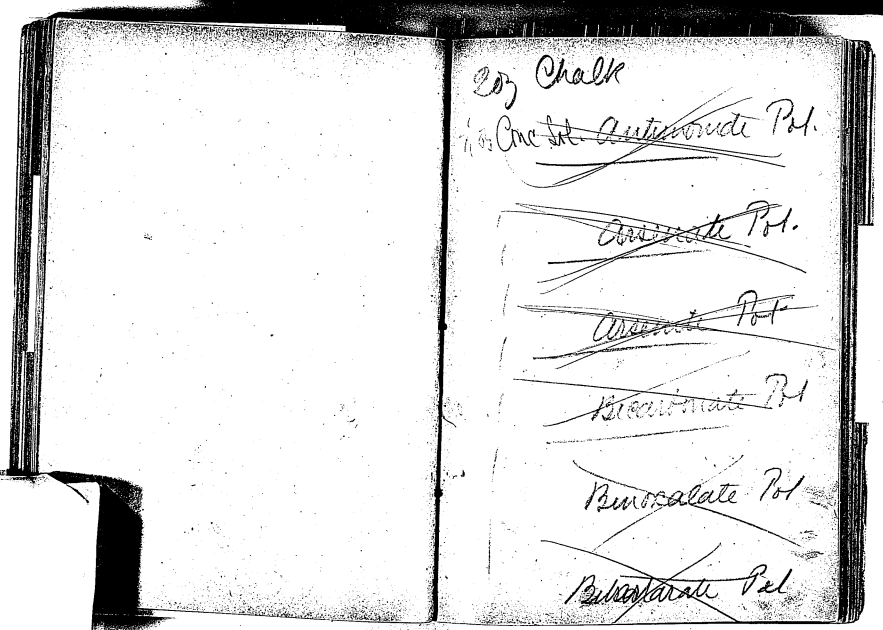
½ ℥ Chalk
½ ℥ Conc Gum Tragacanth
Mucilage
Add ¼ fl. ℥ Caustic Soda

2 ℥ Chalk
¼ ℥ Conc. Sol. Pyrogallic Acid
10 drops Caustic Soda

2 ℥ Chalk
½ ℥ Conc Sol Chloride Magnesium



2ʒ Chalk
½ʒ Conc. Sol. Nitrate Magnesia
2ʒ Chalk
½ʒ Conc. Sol. Sulphate Magnesia
2ʒ ~~Chalk~~
½ʒ Conc. Sol. ~~Sulphate~~ Magnesia
2ʒ Chalk
10 grains Sulphas Aq. Mercury
½ʒ Caustic Na
2ʒ Chalk
½ʒ Conc Sol ~~Acet Potass~~


Dog Chalk
Oxalate Pol.
Oxalate Pol.
Oxalate Pol
Oxalate Pol
Binoxalate Pol
Binoxalate Pol

~~Bromide Pot.~~

~~Chlorate Pot.~~

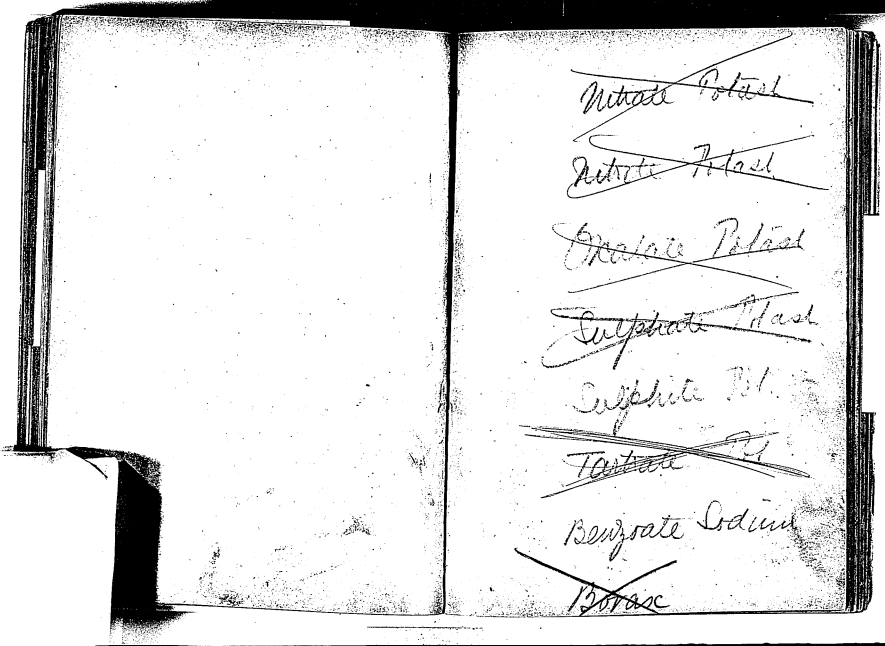
Chloride Pot.

~~Chromate Pot~~

~~Citrate Pot.~~

Hypochlorate Pot

Hypophosphite Pot


Nitrate Potash
Nitrite Potash
Chlorate Potash
Sulphate Potash
Sulphite Pot.
Tartrate Pot.
Benzoate Sodium
Borax

~~Chloride Zinc~~

Bisulphite Sodium

Bisulphate Sodium

Benzoate Sodium

~~Benzoic Sodium~~

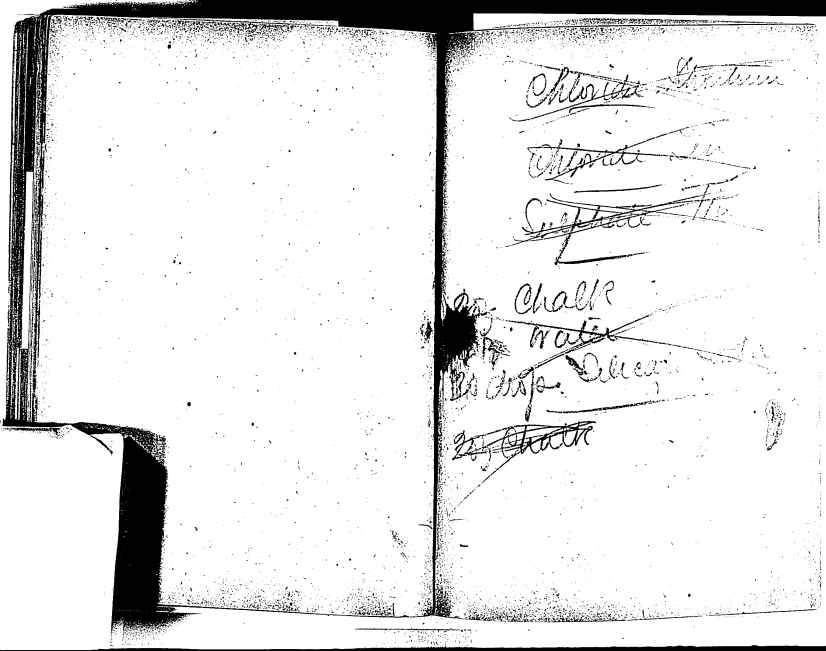
~~Salicylate Sodium~~

Citrate Sodium

~~Dextrate Sodium~~

~~Tungstate Sodium~~

Acetate ~~Chromia~~



2 oz. Chalk.
~~1/4 oz. Acetic Acid~~
~~No water~~

2 oz Chalk
1/4 oz (fluid) Phosphate
Soda

Edisons Telephone Sept 18th 1879

Chas Batchelor

We noticed that with our new telephones a fault in that the chalk never had so clear a track as noticed in former ones, after perusing this of persistently for four nights we find that there is considerable difference between our chalks now and previous lots, but on getting some "Extra precipite" found we were all right. ==

In our inertia telephones with Jablochkoff candle carbons in we noticed a deterioration and on investigation under microscope found undecorated with known stuff.

I now took a piece of Jablochkoff Carbon

and heated it on bunsen burner and on examination under microscope it showed itself covered with brown fluffy stuff; scraped this off and heated again and same stuff came out in less quantity.

A piece of Wallace carbon under same treatment gave a white stuff and also showed some pieces of silica scattered over its surface also in telephone we noticed that some of the Wallace carbons were perfect insulators, probably due to one of these pieces of silica being in contact with platina instead of carbon

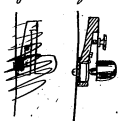
A piece of carbon stick that came from Mr Cleland and looking

like Thompson Carbon gave out no other stuff when heated but the grain was much coarser than either of the others

Used all these for transmitter also =

Used Plumbago which is very good but there is little margin of adjustment

We now altered the inertia cup to 9/16 and I cut a carbon button of our old style to size and put it in as :— This worked well



but not as loud as old transmitter we now altered the weight making it four times heavier but without any great difference.

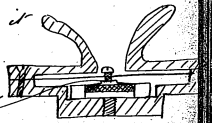
We now took the ordinary inertia again & put in a Platinum Black button

We made a brass sleeve to hold the carbon and forced into the mercury cup. in order to make one end of brass sleeve and also one end of carbon touch one platinum permanently and get the vibration all from the other face, these were very sensitive at a distance but were no improvement close too We tried this with Jablochkoff candle carbon, Wallace, St Clairs, plumbago, platinum black,

We now made some more tests on the old Carbon transmitter and found that it kept its resistance more uniform, was louder, could stand a large battery power, and in many ways was preferable to the mercury and decided to put them in our Long line telephones

This telephone transmitter which has never been beaten in loudness or distinctness by any body else's make owes its superiority to the fact that its adjustment is perfectly rigid and its surfaces perfectly flat — As the movement of the diaphragm at any time during talking cannot be more than the 1/001 of an inch, it stands to reason that if there is any shake in adjustment or any vibrating of surfaces it uses this movement all up in taking up such slacks etc

We propose to use it as:—



Sept 16 1899.

Alex Bell

Chas Sumner Tainter

Edison Telephone Sept 18th 1879

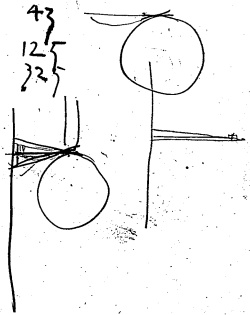
Asa Batchelor

One of the great difficulties with our inertia telephones is that after using some time a number were taken down and tested for resistance with same pressure on each. They varied from 140 ohms to 6 ohms and some were insulators. This variation would kill them entirely

Coils after paraffining

Prim. .43 Ohms.
Sec. 11½ "
Ter. 379 "

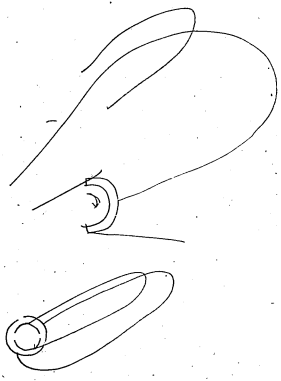
P 43
S 12.5
T 325

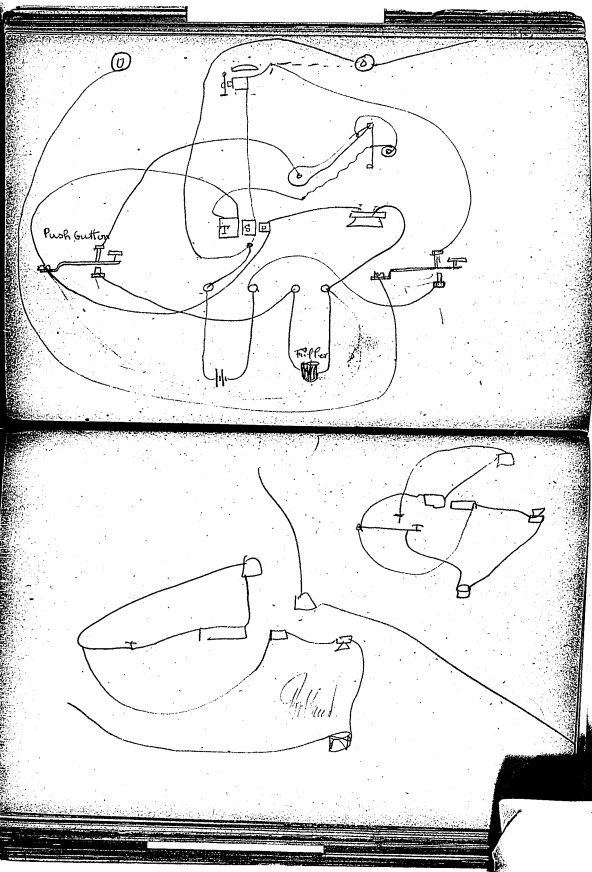


0037 1588 132

0005
50
37
130
121
40

132
1188
237




Push button
Trigger

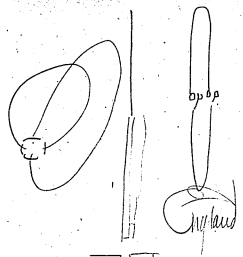
10

24

25

2
4
8
16
32
64

1/2
1/4
1/8
5/16



England

Portland

Portland

$2 \overline{)356}$ $\quad 17.80$

$1780 \quad 1780 \quad 18\frac{1}{2}$

$356\overline{)1780} \quad \overline{)1424} \quad 18$

$\quad 1780$

$\quad 3\,2040$

$12 \cdot$

$12 \overline{)78.} \quad 6\frac{1}{2}$

$102 \quad 255 \quad 40$

$102 \quad 36 \quad 6$

$204 \quad 1 \quad 240$

$2\frac{1}{2} \cdot 1004$

$62\,00$

620

$2\frac{1}{2} - \frac{1}{16}$

$6200 \quad 6200$

$12400\,00$

372000

$5840\,00\,00$

16

16

96

16

$25\,6$

$24 \quad 102,400$

1900

16

17400

17000

4000

18

$17\frac{1}{10} \quad 97 \quad 7$

$\quad 77$

$\quad 679 \quad 6$

$6\,73 \quad 4$

$94\,09$

$\quad 6$

1000

17

12600

17000

$3\,1000$

1900

15200

$3\,2\,200$

9409

44

37636

37636

$218 \overline{)413996} \quad (1895$

$\quad 218$

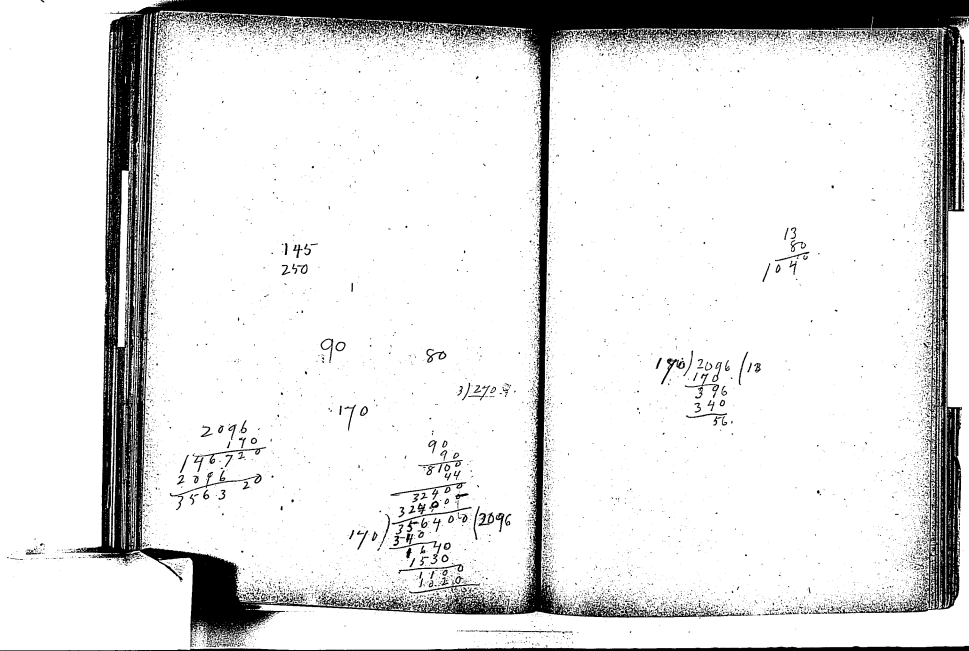
$\quad 1959$

$\quad 1844$

2154

1971

$18\,6$



145
250

90

80

170

3)270.8

2096
170
17672 0
2096 20
3563

90
90
8100
32400
32400 0
170)3564000(2096
340
2440
1530
1020
1020

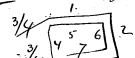
13
80
1040

170)2096(18
170
396
340
56

Present armature

any 10 X 10 in

A



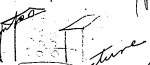
8 1/2 turns

.14 ohm

#24 wire

present armature

10 : 1



11 lamps

11

.14

140 | 1960.0

98

20

.7 H.P on armature

amps 60 | 2116 | 45 | 5964 sq in

1200

2+

3.2 times the amps can be carried

3.2

.7

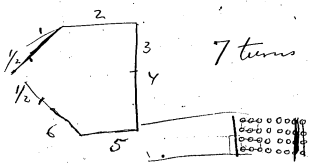
2.14 H.P current

2.14

2.14 lamps

1

20 inch armature



7 turns

$\frac{6}{24}$ A per foot

$\frac{7}{8.5} \times \frac{6}{24}$ the resistance of

A

X X $\frac{7}{8.5} \times \frac{1}{4} \times 2$

37.6

2.49

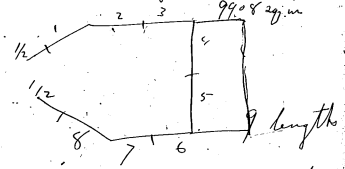
.117 | 49 (28

34

150

.028 ohms resistance

20 inch long
20 inches long
7436 sq. in.



1/2 the commutators to give E. M. F.

96 then 4 to 2 then 1/3 resistance per foot

48 wires in place 24
1/2 the length
1/4 the resistance
1/6 the resistance

.002 .004 .024 4/24 X 1/4 = .006 ohm

.001 .007 .028 9/28 X 1/4 = .009 Ohm

If square wire can be used .005 Ohm

120 H.P.
120 / 840) 100.0 (.12
840
1600

8 in the current
.001

24 : 1 square wire

120 / 960

13 : 1 round wire

75/2 = 37.5

39 coils will do it.

$\frac{11}{9} \times .009$

.011 Ohm

.11) 100.00 (909 lamps
99
100
99
1

120
8
960) 100.00 (.1
960
400
1400000 13
10
13 00

Diagram connections machine

Diagram of system

The ~~Coops~~ Machines

Keep ~~dirt~~ armatures dry and free from chips or dust

In case of excessive heating examine carefully, if one coil is black, it shows that ~~the~~ it is crossed and that the machine is worthless unless it is rewound. This coil may be pulled out and a single wire run into place

If the bearings heat

Keep the arms on which the brush holders are fastened clean so that no cross will occur

In adjusting the commutators ~~Xxxx~~ avoid going too far so as to strike the base of the machine.

A side ways movement of brushes ~~xxxxxxxxxxxxxxxxxxxx~~ may be given to bring them ~~xxxx~~ in a new track on the commutator.

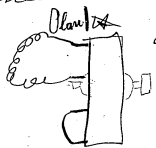
after brushes become smooth ~~xxxx~~ on one side change sides. The shaft on which the brush arms can also be slightly changed

The commutator should be kept carefully wiped with a piece of woolen cloth having a little oil on it.

The brushes should have no loose ~~xx~~ wires and should be placed opposite and so that the least possible spark occurs. As soon as ~~the~~ a wire is worn through it should be cut off so that there rests against the commutator only the sides of wires

If the covering over the commutator become torn repair immediatly and be sure no dirt gets in between the blocks before repairing at A.

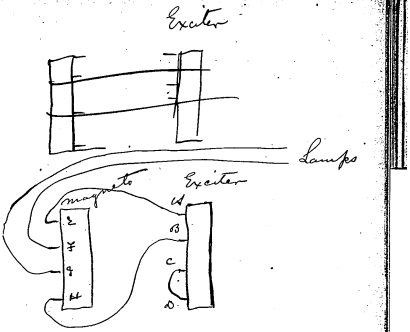
The exciting machine to act must have connections made like this



or

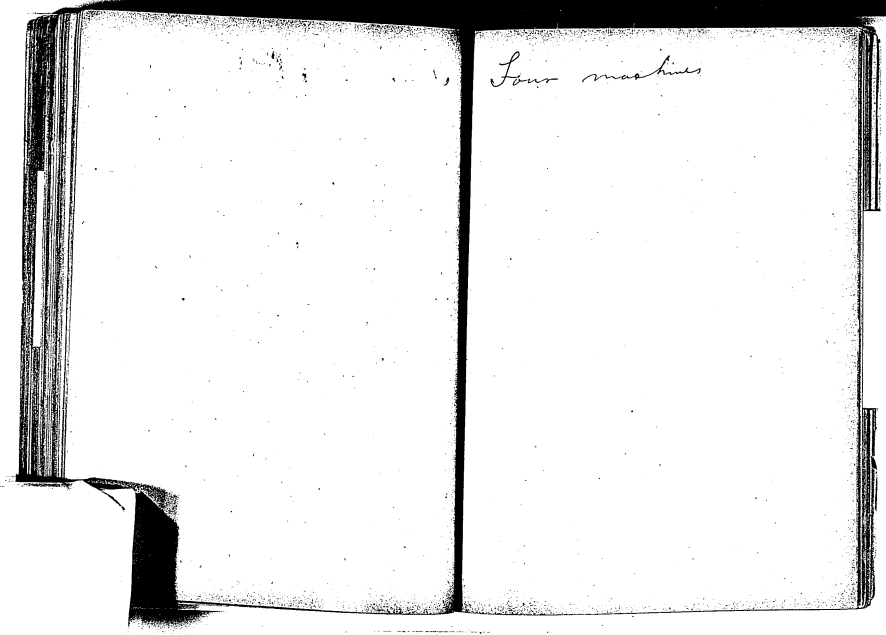
That is if a spark cannot be obtained by A, B will always give one.

To run machine from the exciter connections are made thus

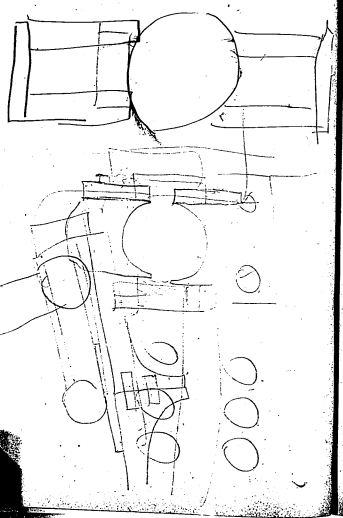


~~Four connections are~~ as follows.

The current starts at A


Four machines

To connect the machines a good way is to start slowly after the connections with the magnets have been made, and the lines at the switch board are all disconnected. Then put the middle or armature binding posts of one machine in connection with the main line. Then of a second machine, if the connections have all been made correctly there should be little or no sparks seen on taking out the plug. But if not, a



considerable. Work may occur. Then try the third machine.

When the belt is off of a machine and the other machines are running never put the plug in of that machine.

~~Lubricating~~

~~Lubricate of Lamp~~

~~Changing~~

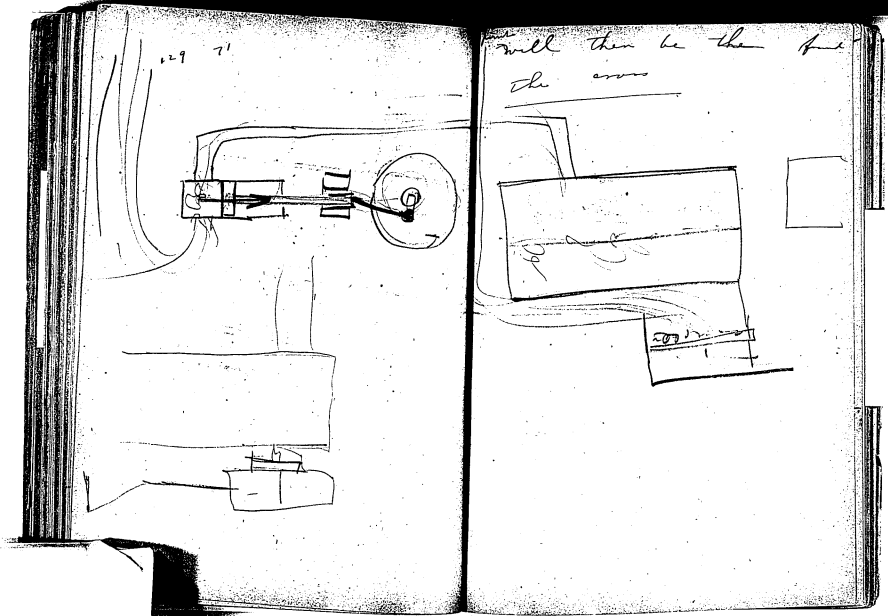
The state room

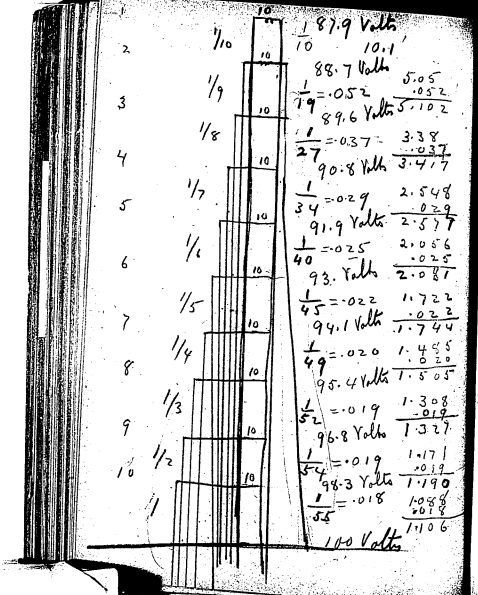
Lamps gone out
First see if the carbon
is broken if it is
change lamps. ~~Burn lamps~~
~~carbon very easily~~ If
no fault can be found
in the carbon examine
the safety clutch if that
is gone it shows that
there has been some ~~trouble~~
trouble with the line Put
in a new clutch and
try if that melts off
the trouble is in the
lamp or short line leading
to it. Disconnect the lamp
and try a new safety
clutch if that burns the

is in the short line
If not take down the
lamp and examine the
two wires leading into
it four crosses.
If the safety clutch
is all right examine
the connections leading to
the lamp. If they are
all right turn the
key in the switch several
times and reexamine the
carbon. Then if no trouble
can be found cross the
two wires that lead
into the lamp ~~so that~~
to see if the safety clutch
melts off. If it does take
down the lamp. If it

does not examine line and switch for track.

If ever the main wires become crossed, run the machine slowly and follow along and the cross cannot be found by tracing over the lines. Run the machines slowly and with a compass needle trace over the line to see when it stops giving a deflection at which





$$\frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{R} \quad - \quad -$$

$$R = \frac{R_1 R_2}{R_1 + R_2} =$$

$$\frac{\frac{1}{10} \times \frac{1}{9}}{\frac{1}{10} + \frac{1}{9}} = \frac{1}{9+10}$$

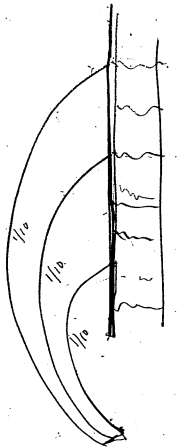
$$\frac{\frac{1}{a} \times \frac{1}{b}}{\frac{1}{a} + \frac{1}{b}} = \frac{1}{a+b}.$$

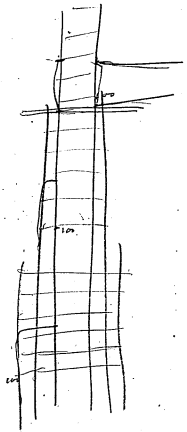
$$\frac{10.1 \times 10}{20.1}$$

10.1) 10 (.5
5.05
.052
5.102

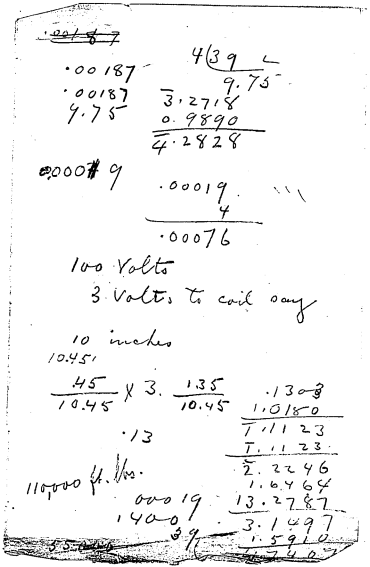
5.102) 5.102 (3.38
453
.037
572
453
3.417
1190
1208

5.05 — 2 95-256
5.102 — 0 70329
comp — 9.29226
7.94811


1/10
1/10
1/10



[ITEM FOUND IN BOOK]



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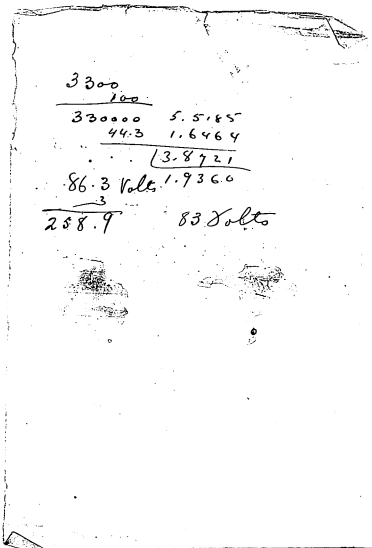

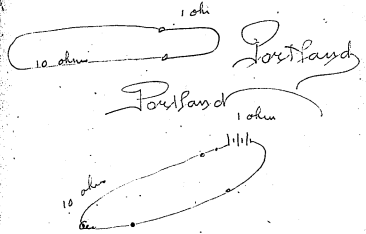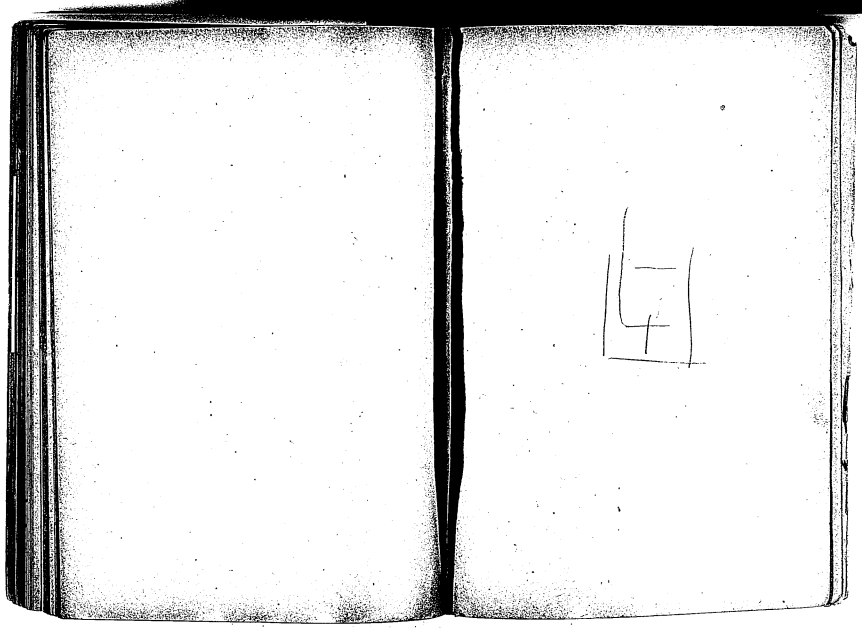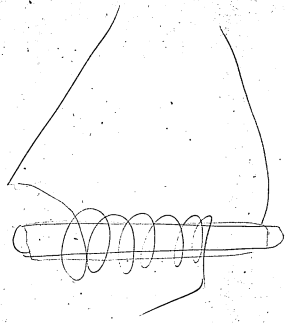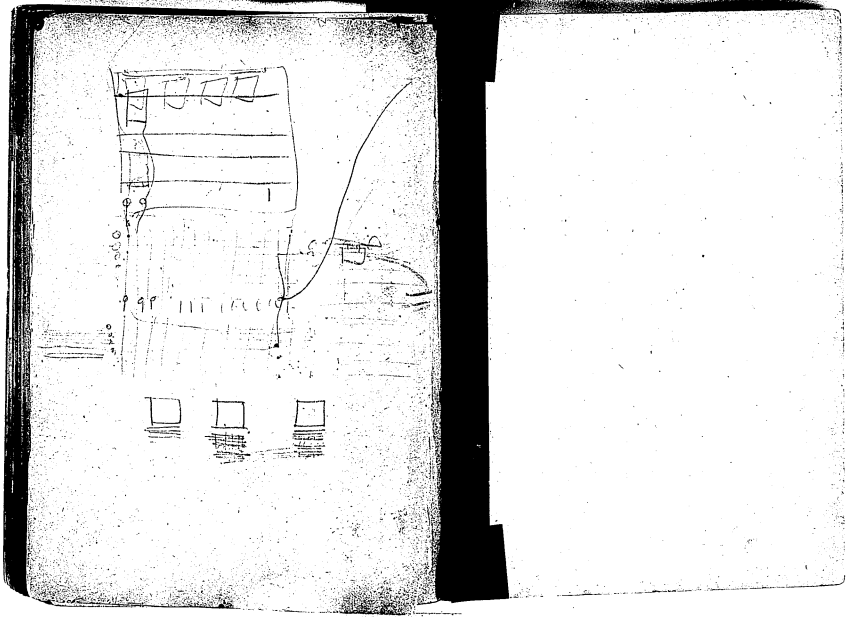
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